California Environmental Protection Agency

Air Resources Board

Spark-Ignition Marine Watercraft Regulation Update

May 28, 2014 - El Monte

June 4, 2014 - Sacramento

Presentation Outline

Section 1: Draft Regulation Overview

Section 2: Draft Test Procedures

Section 3: Emissions Inventory

Section 4: Certification

Draft Regulation, Draft Test Procedures, and Draft Certification documents are available at: http://www.arb.ca.gov/msprog/offroad/recmarine/recmarine.htm

Section 1

Draft Regulation Overview

Presenter: Scott Monday

Purpose of ARB Regulation

- California has the worst air quality in the nation
- ARB develops regulations to reduce emissions to comply with the federal Clean Air Act requirements
- The draft regulation meets the commitment described in California's State Implementation Plan
- Emission reductions associated with the proposal will help California attain air quality objectives for ozone

Spark-Ignition Marine Watercraft (SIMW) Rulemaking Update

- Program name change to be consistent with Health and Safety Code
  - "Marine vessel" to "marine watercraft"
- Planning on February 2015 Board hearing
- Collaborating with industry
- Seeking comments on changes

Changes to Draft Regulation Since 2010 Workshop

- Implementation date has been extended to MY2018
- E10 Certification Fuel specifications[1]
- Allows metal fuel tank exemption
- Minor edits for consistency and clarity

[1] As specified in "California 2015 and Subsequent Model Criteria Pollutant Exhaust Emission Standards and Test Procedures and 2017 and Subsequent Model Greenhouse Gas Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles" Section II.A.100.3.1.2 as adopted March 22, 2012.

Proposed Standards

- All standards proposed at 2010 workshop are unchanged
  - Alternative tank permeation standard added
- Proposal harmonizes with U.S. EPA for marine watercraft less than or equal to 30 kW (40 HP)
- ARB standards apply to marine watercraft with engines greater than 30 kW (40 HP)
  - Will apply to trailerable and nontrailerable marine watercraft

Pathways to Compliance

- ARB's draft regulation has two methods for demonstrating compliance:

1. Design-Based – Requires marine watercraft manufacturer to use specific ARB certified components for:
   - Fuel injection
   - Low permeation fuel hoses
   - Low permeation fuel tank
   - Passively purged carbon canister or pressure relief valve

2. Performance Alternative – One standard for the complete boat or fuel system
   - Based on a 24-hour diurnal test (TP-1501)

Design-Based Standards: ≤ 30 kW (40 HP)

- All evaporative emission standards (including fuel cap, fitting, and carbon requirements) and test procedures will be harmonized with U.S. EPA

Model Year (MY) Effective Date	Fuel Hose Permeation (grams/m²/day ROG)	Fuel Tank Permeation (grams/m²/ day ROG)	Diurnal Requirement (grams/gallon/ day HC)	Fuel Injection or Equivalent (grams/hour)
2018 and later	15.0	1.5	0.4	None
Test Procedure	40 CFR §1060.515	40 CFR §1060.520[1]	40 CFR §1060.525	None

[1] As an alternative, fuel tanks can be certified to 2.5 grams/m²/day at 40°C

Design-Based Standards: > 30 kW (40 HP) Trailerable

- For MY2018 and later, evaporative emission requirements (such as fuel cap, fitting, and carbon requirements) will be harmonized with current U.S. EPA requirements

- For MY2018 and later, in addition, ARB proposes to set more stringent standards for fuel hose and fuel tank permeation, diurnal emissions, and require fuel injection

- For MY2020 and later, ARB proposes to lower the fuel hose permeation standard
  - Executive Officer must first confirm commercial availability

Design-Based Standards: > 30 kW (40 HP) Trailerable

- Applicable to marine watercraft ≤ 26 ft. in length and ≤ 8.5 ft.in width

Trailerable Boats					
Model Year Effective Date	**Fuel Hose Permeation** (grams ROG/m²/day)	**Fuel Tank Permeation** (grams ROG/m²/day)	**Diurnal Tank Venting Loss Requirement** (grams HC/gallon/day)		**Meet Fuel Injection Definition or Equivalent Performance Standard** (grams HC/hour)
			Canister	Non-Canister	
2018 and 2019	10.0	0.70	0.25	65% reduction from uncontrolled HC emissions	0.4
2020 and later	5.0[1,2]	0.70	0.25	65% reduction from uncontrolled HC emissions	0.4
Test Procedure	TP-1504 or SAE J1737	TP-1504[3]	TP-1503		TP-1502

[1] Upon Executive Officer confirmation of commercial availability
[2] Must be performed at 40°C
[3] As an alternative, fuel tanks can be certified to 1.4 grams/m²/day at 40°C

Design-Based Standards: > 30 kW (40 HP) Non-Trailerable

- For MY2018 and later, evaporative emission requirements (such as fuel cap, fitting, and carbon requirements) will be harmonized with current U.S. EPA requirements

- For MY2018 and later, in addition, ARB proposes to set more stringent standards for fuel hose and fuel tank permeation, diurnal emissions, and require fuel injection

- For MY2020 and later, ARB proposes to lower the fuel hose permeation standard
  - Executive Officer must first confirm commercial availability

Design-Based Standards: > 30 kW (40 HP) Non-Trailerable

- Applicable to marine watercraft > 26 ft. in length or > 8.5 ft. in width

Non-Trailerable Boats				
Model Year Effective Date	**Fuel Hose Permeation** (grams ROG/m^2/day)	**Fuel Tank Permeation** (grams ROG/m^2/day)	**Diurnal Tank Venting Loss Requirement** (grams HC/gallon/day)	**Meet Fuel Injection Definition or Equivalent Performance Standard** (grams HC/hour)
2018 and 2019	10.0	0.70	0.16	0.4
2020 and later	5.0[1,2]	0.70	0.16	0.4
Test Procedure	TP-1504 or SAE J1737	TP-1504[3]	TP-1503	TP-1502

[1] Upon Executive Officer confirmation of commercial availability
[2] Must be performed at 40°C
[3] As an alternative, fuel tanks can be certified to 1.4 grams/m^2/day at 40°C

Performance Standard: > 30 kW (40 HP)

- Alternative to design-based certification
- Complete boat or fuel system must be tested in a Sealed Housing for Evaporative Determination (SHED)
- Testing is conducted over a 24-hour diurnal cycle following TP-1501

Marine Boat Type	Model Year Effective Date	Diurnal Standard (grams HC/day)
All Marine Boats With Engines > 30 kW (40 HP)	2018 and later	0.048 * Tank Volume (liters) + 0.97

Anticipated ARB Control Technology

Similar to U.S. EPA controls except more stringent evaporative components

- Lower Permeation Fuel Tank

- Carbon Canister or PRV

- Lower Permeation Fuel Hoses

- Fuel Injection

Component Cost Survey

- ARB performed a follow-up component cost survey in 2013
- The estimated increase in retail cost for representative marine watercraft was determined from component cost surveys with added markup
- Markup for segments of industry was applied at three levels
  - A 20% markup was added to:
    - Component Manufacturer
    - Marine Watercraft Manufacturer
    - Dealer

- Staff used these surveyed component costs and markups to determine the increased cost to the consumer

Average Estimated Retail Cost Increase

Estimated Increase in Retail Cost for Representative Marine Watercraft

Marine Watercraft Category	Average Estimated Retail Cost Increase*
Personal Watercraft	~$27
Outboard	~$42
Sterndrive/Inboard	~$42

* Based on 2013 cost survey data

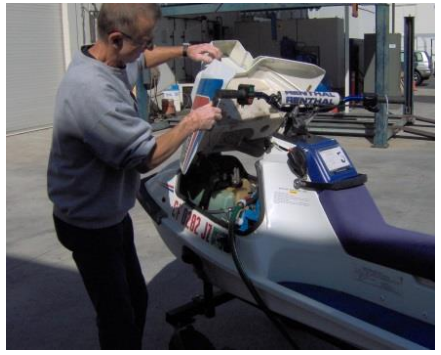
Section 2

Draft Test Procedures

Presenter: Scott Monday

Proposed Test Procedures

- Worked with manufacturers and testing groups to identify and resolve issues with the test procedures
- Focus on harmonization with U.S. EPA to avoid duplicative testing
- Updated to include tolerances and improve clarity



Test Procedure Modifications

- Testing will require California E10 certification fuel

- No other major changes to the following test procedures:
  - TP-1501 Complete Marine Watercraft Performance
  - TP-1502 Fuel Injection Equivalent
  - TP-1504 Fuel Hose and Fuel Tank Permeation
  - TP-1505 Pressure Relief Valve Performance

TP-1503 Venting Control

- Carbon Canister
  - Durability requirements added
- Pressure Relief Valve
  - Durability requirements modified
    - Tolerances
    - Temperature Stabilization

Section 3

Emissions Inventory

Presenter: Walter Wong

Inventory Development & Summary

- Comprehensive Update (evaporative and exhaust)
  - Evaporative emission factors based on data from a contract with Automotive Testing Laboratory (ATL) and ARB in-house testing
  - Population from DMV data (2006 to 2011)
  - Annual activity, areas of operation, and storage from a CSUS survey

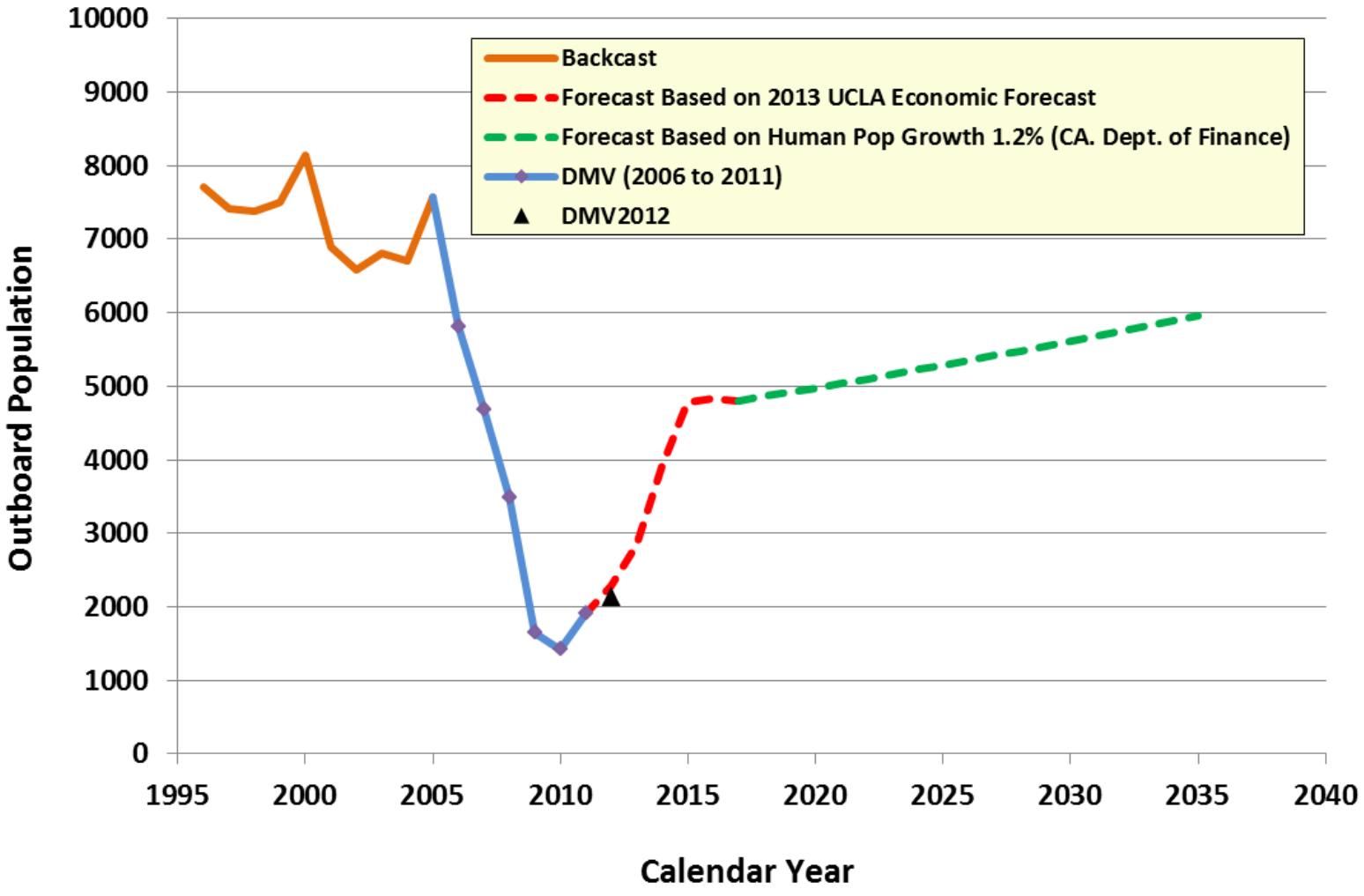
- Updated sales forecast reflects recession and estimated recovery
  - During recession watercraft sales declined by 90%
  - Short-term sales forecast tracks UCLA economic forecast for housing starts
  - Long-term sales forecast is based on DOF population growth forecast

- Statewide summer ROG baseline emissions and benefits
  - By 2023, ROG baseline is 106 tpd (emission benefit < 0.5 tpd)
  - By 2035, ROG baseline is 60 tpd (emission benefit < 1 tpd)

Sales Forecast Assumptions

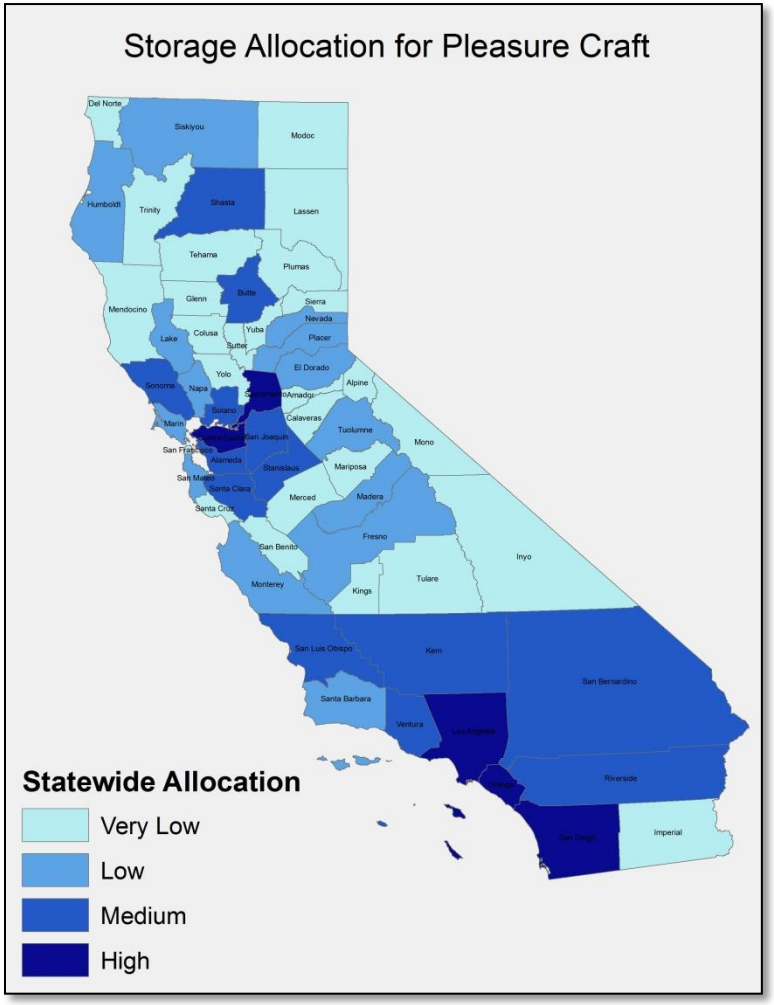
- Populations of specific watercraft types based on DMV data up through 2011
- Short-term forecast (2012 to 2017) is based on 2013 UCLA Economic Forecast and uses housing starts as a surrogate
- Long-term forecast (2018+) is based on California Department of Finance (DOF) forecasted human population growth of 1.2% per year

Outboard Annual Sales Forecast

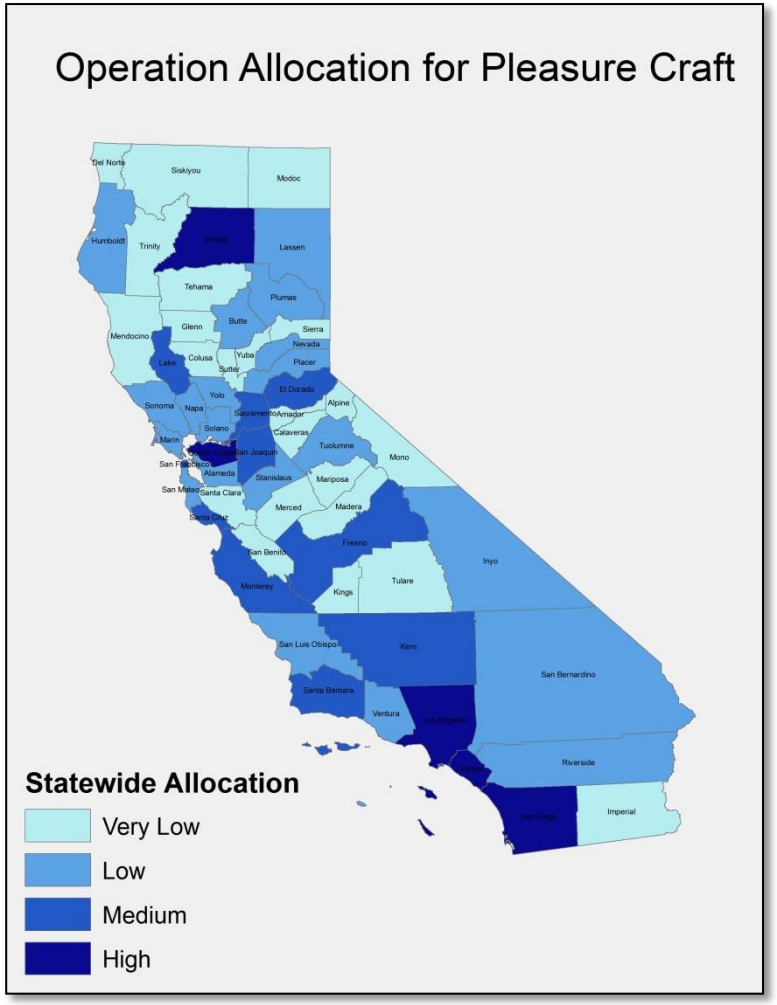


Spatial Allocation

Area of Storage



Area of Operation

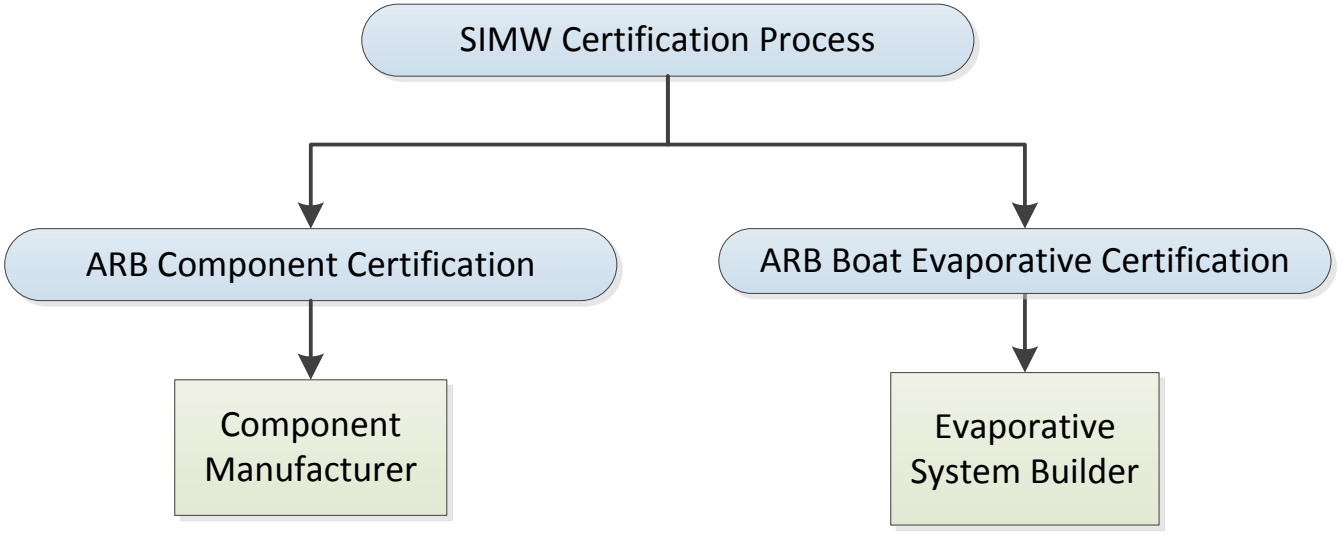


Section 4

Certification

Presenter: Kevin Curley

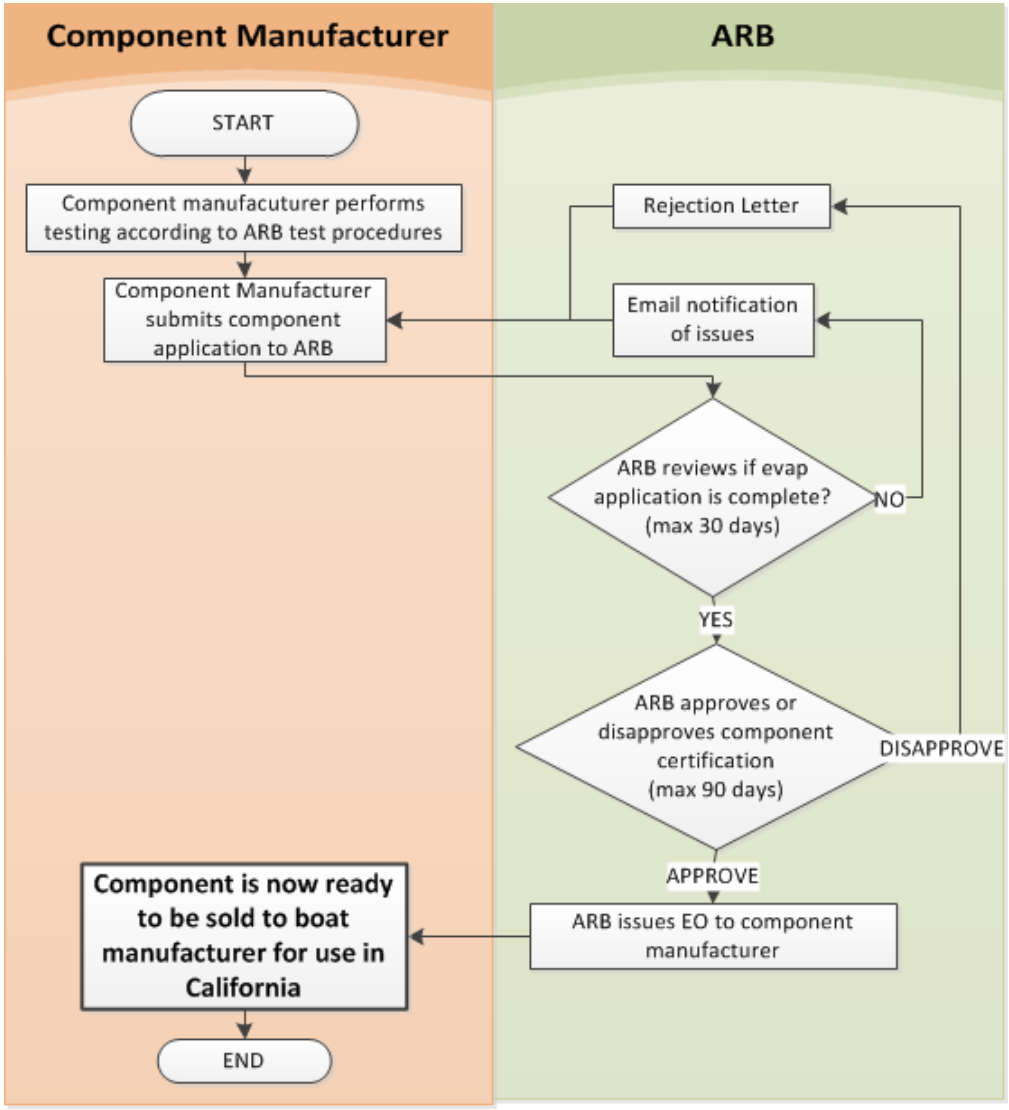
Overview of ARB Evaporative Certification Process



ARB Component Certification

- Similar to U.S. EPA
- Must include 5 data test points
- Application must be deemed complete by ARB before it can be processed
- ARB will issue a component Executive Order (EO) for each component
- Engine manufacturer responsible for certification of fuel injection system
- Application will be submitted to the Monitoring and Laboratory Division

ARB Component Certification Process



Evaporative System Builder Definition

- Any business, company, or manufacturer that installs or mounts a complete evaporative system on a spark-ignition marine watercraft *(Title 13, CCR, §2853)*

- This could be a:
  - Boat builder
  - Fuel system builder/integrator
  - Engine manufacturer
  - Dealer

Evaporative System Builder Responsibilities

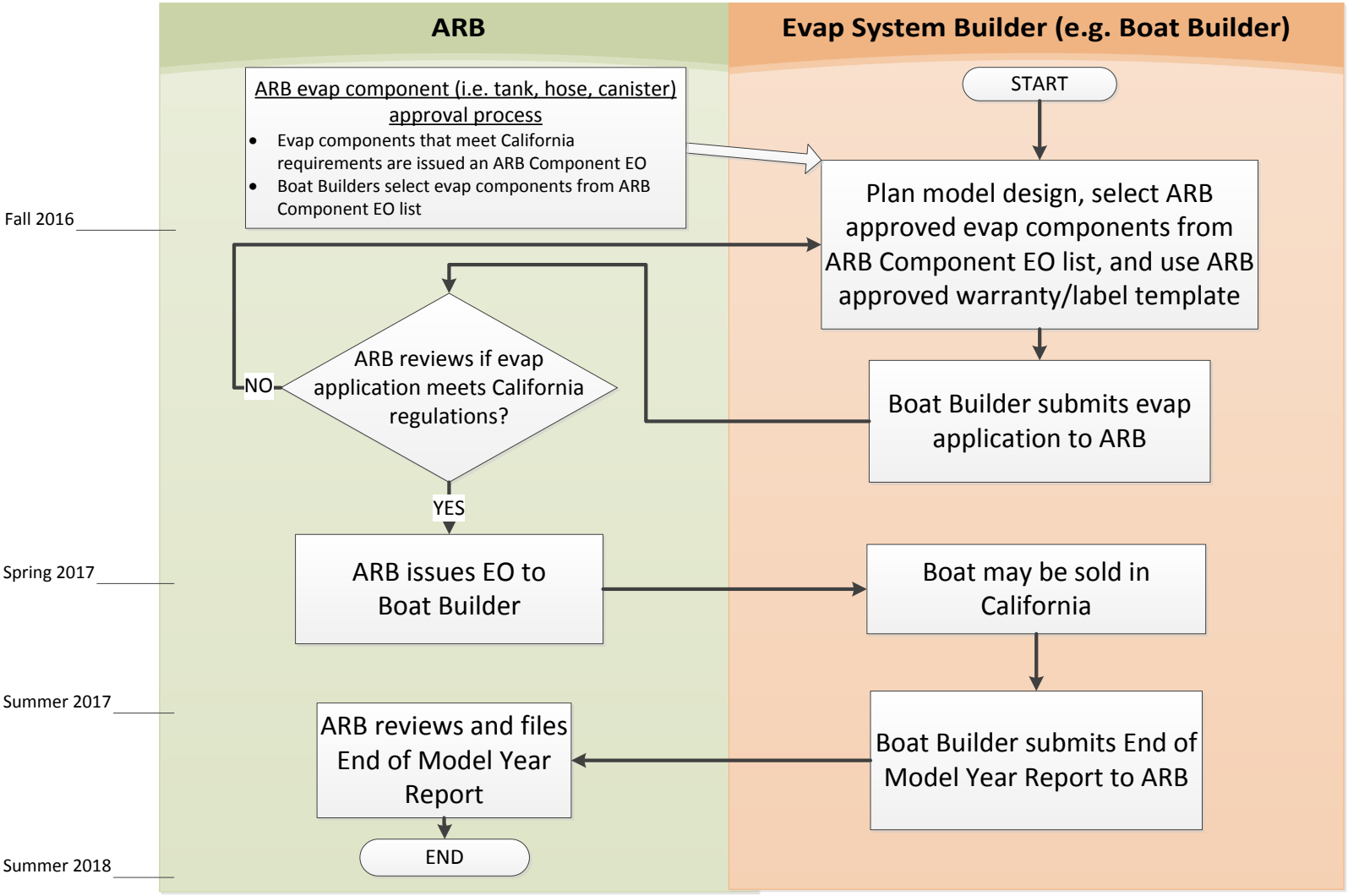
- Evaporative system builders (e.g. boat builders) demonstrate their evaporative system meets requirements
  - Design fuel system using ARB certified components
  - Placement and integration of evaporative components
  - Proper installation of complete evaporative system
  - Labeling and warranty
  - Other requirements
  - Obtain ARB EO

ARB Boat Evaporative Certification Process

- Why is ARB boat evaporative certification required?
  - Provides a formal legal document (EO) showing that the boat is ARB certified for evaporative emissions
  - Levels the playing field for all manufacturers who are complying with current U.S. EPA and proposed ARB requirements

ARB Boat Evaporative Certification Process

Design-Based (2018 MY Example)



Boat Builder Application Process

- Design-Based Application - Start of Model Year
  - Boat builders submit one application for each evaporative family
  - Boat builder may submit an application at any time after they know the model design
  - On the application, reference the component EO numbers applicable to each evaporative component used in the evaporative family
  - Submit the application to the Emissions Compliance, Automotive Regulations and Science Division
  - If compliant, ARB issues an EO

Boat Builder Application Process
(continued)

- Design-Based Application - End of Model Year Report
  - Submit before end of boat builder's model year
  - A summary of all boat models constructed for the applicable evaporative family
  - Specify the ARB EO approved components used for each model

Marine Vessel or Boat Model	Sales Codes		Fuel Tank Vol. (Liters)	Fuel Tank Material	Fuel Line Type	Fuel Tank Executive Order	Fuel Line Executive Order	Carbon Canister/Venting System Executive Order	Meets Canister Fuel Tank Volume Reqs?	Auxiliary Engine Installed*
	CA Only	50-State								
Sea Ray 210 Select	X		151	HDPE	Multi-Layer	C-U-028-939	C-U-493-92	C-U-39-299	Yes	No

Evaporative Family

- What is an evaporative family?
  - Evaporative family means a class of evaporative components used on boats with similar fuel system characteristics
  - Evaporative families have similar fuel hose types, fuel tank types, carbon canister sizes, etc.

- Characteristics of evaporative families
  - Vented control: carbon canister vs. pressure relief valve
  - Fuel tank types: metal vs. plastic
  - Fuel hose types: U.S. EPA vs. ARB
  - Boat size: trailerable vs. nontrailerable

Evaporative Family

Example – Single Evaporative Family

Fuel System Design	Evaporative Family Type
Fuel Hose Type	A1-15
Fuel Tank Type	Plastic
Vent Type	Carbon Canisters 0.5L – 0-60 gallons 0.75L – 62-93 gallons 1.0L – 93-124 gallons
Trailerable or Nontrailerable	Trailerable

- All models that have these characteristics are considered **one** evaporative family and need only one certification application

Evaporative Family

Example – Two Evaporative Families

Fuel System Design	Evaporative Family Type
Fuel Hose Type	A1-15
Fuel Tank Type	Plastic or Metal
Vent Type	Carbon Canisters 0.5L – 0-60 gallons 0.75L – 62-93 gallons
Trailerable/Nontrailerable	Trailerable

- Models using plastic tanks will be in one evaporative family; models using metal tanks will be in a second family

Label & Warranty

- Labels and warranty statements may be approved ahead of time
- Approval remains valid for future model years provided no changes are made
- ARB will furnish templates for evaporative emissions labels and warranty statements

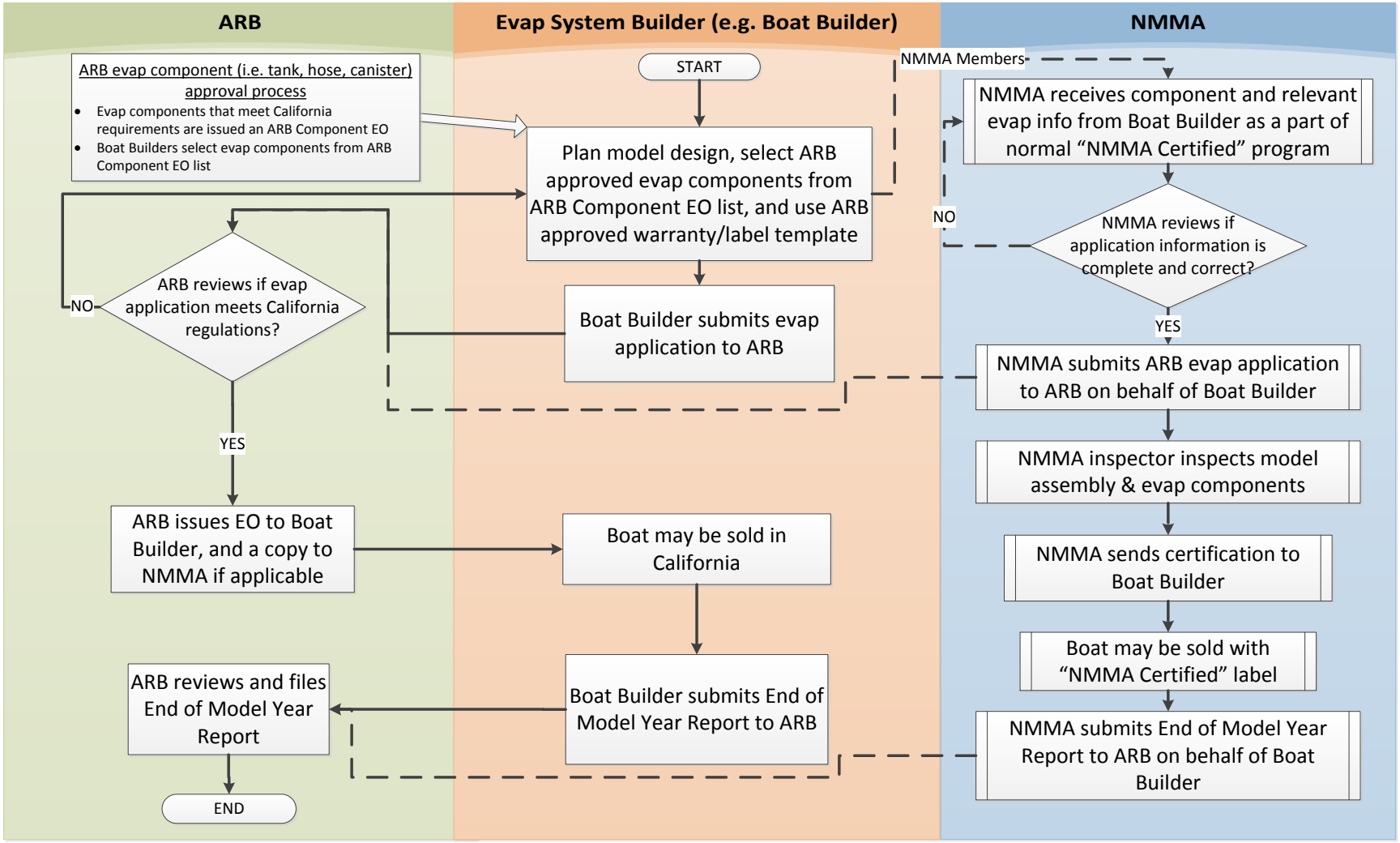
Cooperation with NMMA/ABYC to Date

- NMMA has been actively engaged with ARB
  - Working with ARB since 2006
  - Actively participated in all ARB marine workshops
  - Helped streamline ARB marine certification
  - Provided information about current NMMA certification process
  - Helped to understand the unique manufacturing process of the boat building industry
  - Organized face-to-face meeting with ABYC, industry representatives, and boat builders

ARB/NMMA/ABYC Working Group Efforts

- Conducted several meetings between ARB, NMMA, and ABYC in 2014
- Worked on combined ARB/EPA/NMMA/USCG label
- ABYC has initiated process to incorporate California evaporative requirements into H-24
- Developed alternate ARB evaporative certification process to be streamlined with NMMA safety certification
  - NMMA submits application to ARB for Boat Builder
  - NMMA field inspectors will verify that evaporative components are ARB certified

Proposed Alternate ARB Evaporative Certification Process Streamlined with NMMA



- - - - Alternate path for NMMA members

Cooperation with NMMA/ABYC

Future Action Items

	SUMMER 2014	FALL 2014	WINTER 2015	SUMMER 2015
ARB	Provide NMMA with data fields for ARB certification based on proposed regulations. Approve combined NMMA/ARB/EPA/USCG label format. Work with NMMA to develop emissions warranty template based on proposed regulations.	Attend NMMA Certification inspection. Create ARB application and report formats based on proposed regulations.	Participate in technical session at NMMA Engineering Compliance seminar. (tentative)	
ABYC		Develop an annex in H-24, Gasoline Fuel Systems, standard based on ARB's proposed requirements	Project Technical Committee (PTC) review and Technical Board approval	
NMMA	Create a Type Accepted category for fuel system components needed for ARB certification.	Integrate ARB-provided data fields into NMMA Certification data software Work with ARB on needed reports and develop electronic reports from NMMA Certification database.	Train NMMA inspectors on new ARB requirements of H-24 Distribute information and educate the boat builders through a series of webinars Add the additional H-24 Annex item to the certification inspection checklist.	Integrate the amended ABYC H-24 standard into the Boat & Yacht Certification program.

Next Steps

June 18, 2014:
Workshop comments due

Summer 2014:
ABYC Develops H-24 Annex

February 2015:
ARB SIMW Board Hearing

Summer 2015:
ABYC Publish H-24 Annex

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Questions?